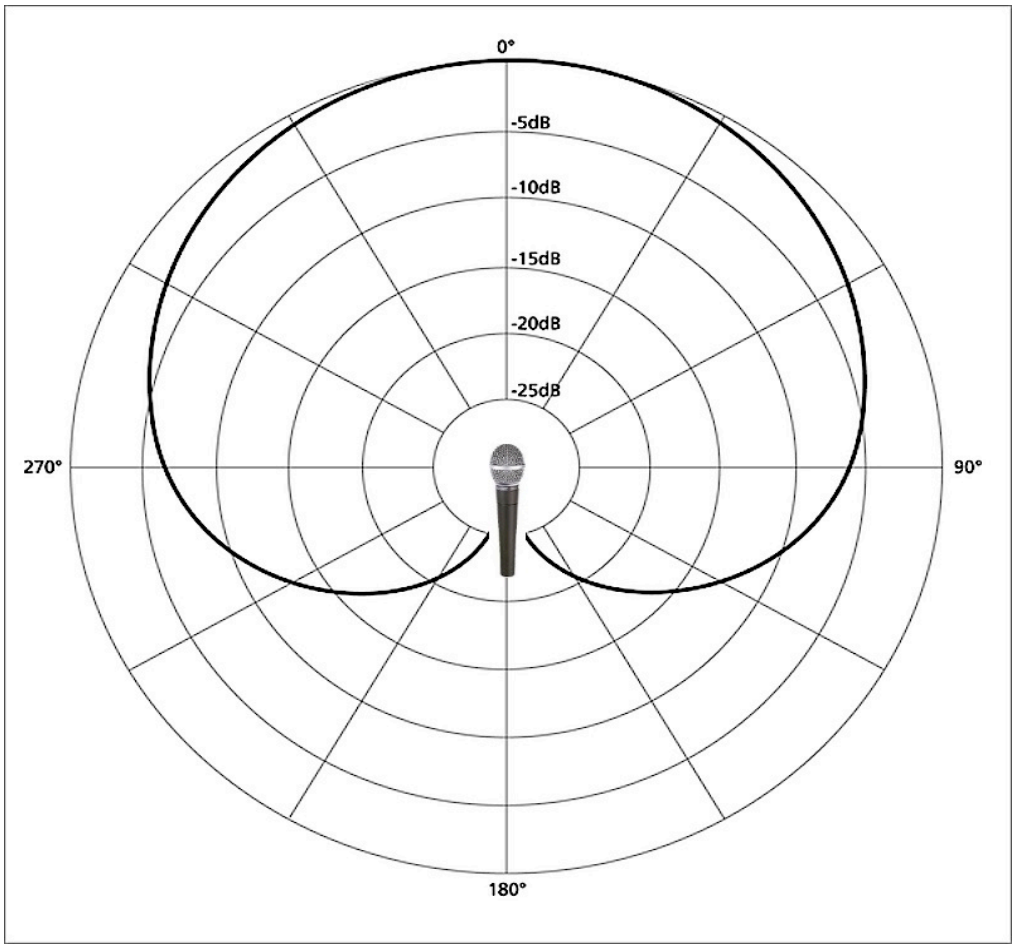
MPR Sound Engineer Presents Methods For Great Recording of Your Students

Microphone Polar Patterns

Cardioid

The most common microphone pattern is a cardioid microphone. The cardioid family of microphones are commonly used as vocal or speech microphones, since they are good at rejecting sounds from other directions. In three dimensions, the cardioid is shaped like an apple centred around the microphone which is the "stalk" of the apple. The cardioid response reduces pickup from the side and rear, helping to avoid feedback from the monitors and rejects the sound from the back of the room when used for recording.



Omnidirectional

An omnidirectional (or nondirectional) microphone's response is generally considered to be a perfect sphere in three dimensions. In the real world, this is not the case. As with directional microphones, the polar pattern for an "omnidirectional" microphone is a function of frequency. Omnidirectional microphones, can be considered the "purest" microphones in terms of low coloration; they add very little to the original sound. Being pressure-sensitive they can also have a very flat low-frequency response down to 20 Hz or below. Pressure-sensitive microphones also respond much less to wind noise and plosives than directional microphones.

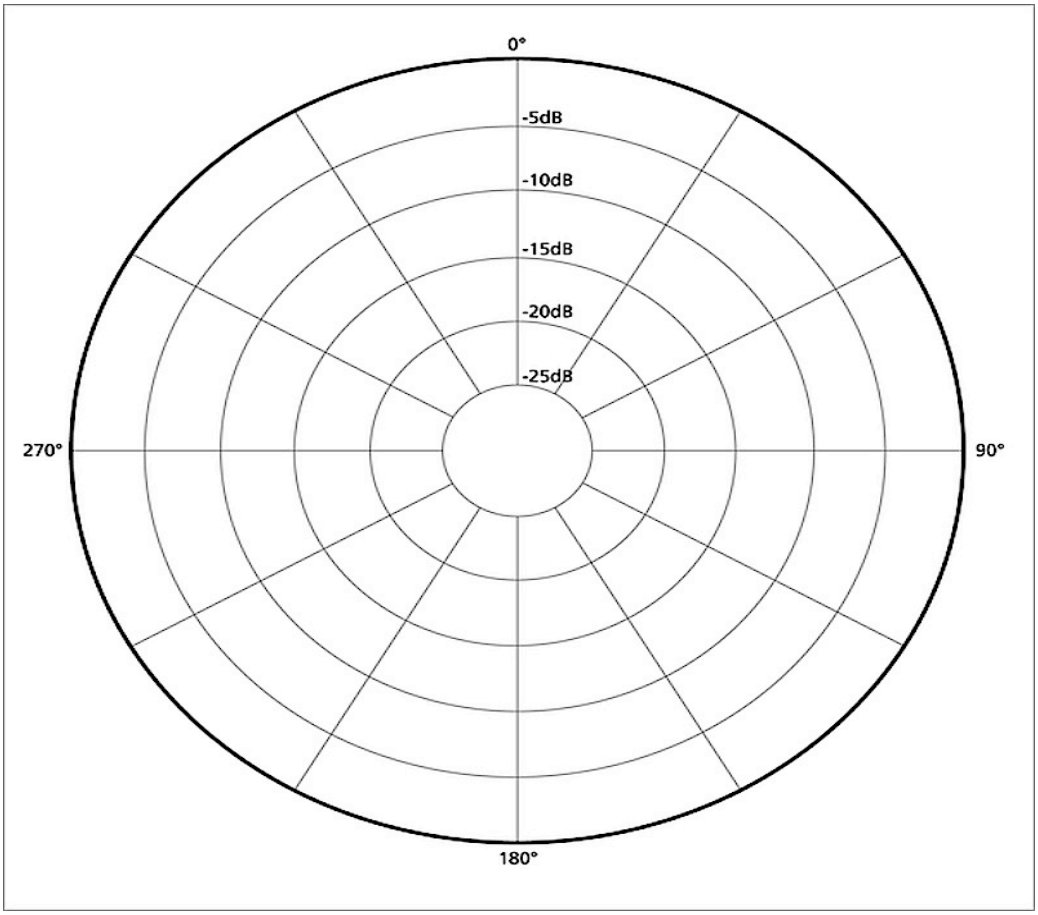
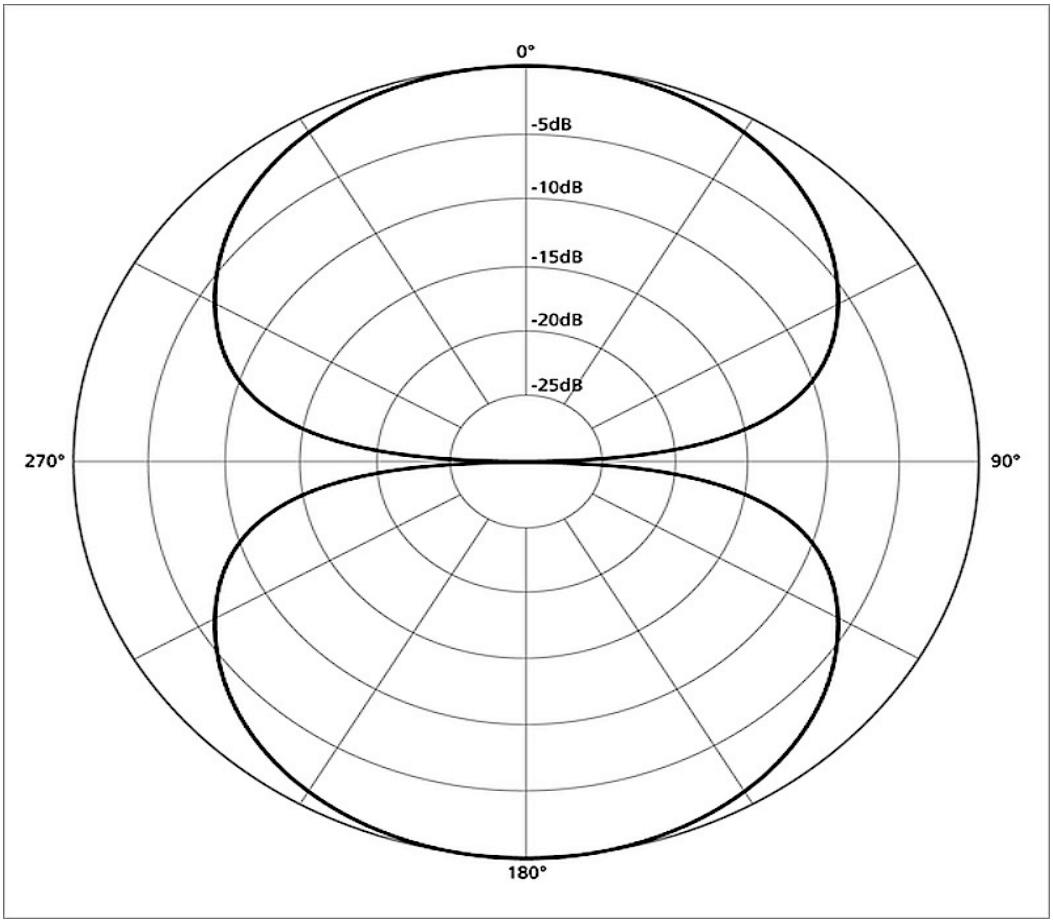


Figure 8 or Bi-directional

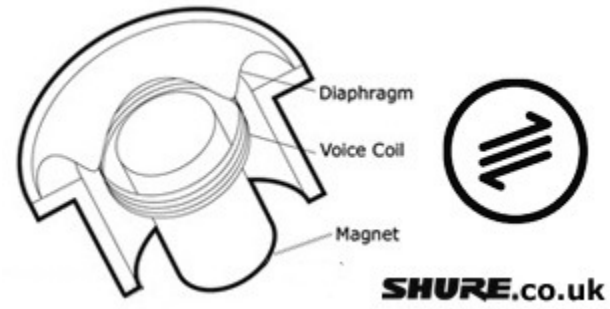
"Figure 8" or bi-directional microphones receive sound equally from both the front and back of the element. Most ribbon microphones are of this pattern. In principle they do not respond to sound pressure at all, only to the *change* in pressure between front and back; since sound arriving from the side reaches front and back equally there is no difference in pressure and therefore no sensitivity to sound from that direction. A figure 8 microphone is very useful when you have a loud source on either of the microphone that you want rejected.



Microphones: Transducer Types

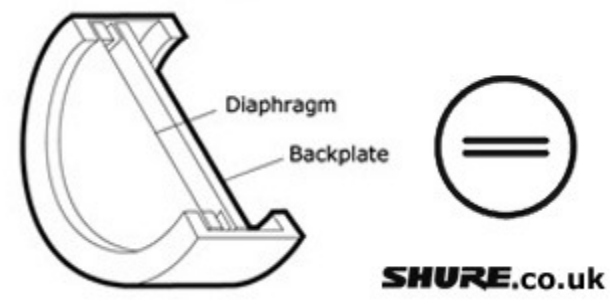
Dynamic Microphones

Dynamic microphones employ a diaphragm, a voice coil and a magnet. The voice coil is surrounded by a magnetic field and is attached to the rear of the diaphragm. The motion of the voice coil in this magnetic field generates the electrical signal corresponding to the picked up sound.
Dynamic microphones have a relatively simple construction and are therefore economical and rugged. The most common use for dynamic microphone are for handheld vocal microphone and close mikes for drum and other very loud instruments. They can handle extremely high sound pressure levels and are largely unaffected by extreme temperatures or humidity. Probably the most common dynamic mikes are the Shure SM58 and SM57. They are not usually the best for stereo miking.



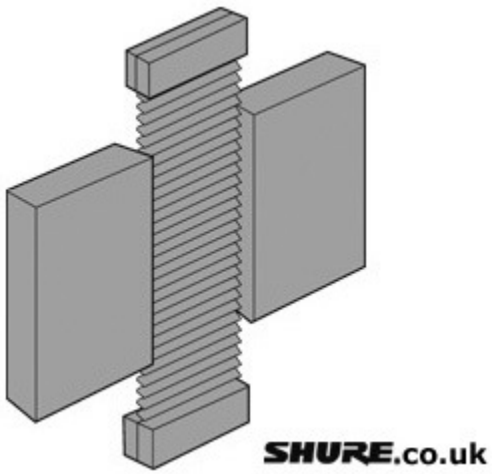
Condenser Microphones

Condenser microphones are based on an electrically-charged diaphragm/backplate assembly which forms a sound sensitive capacitor. When the diaphragm is set in motion through sound, the space between the diaphragm and the backplate is changing, and therefore the capacity of the capacitor. This variation in spacing produces the electrical signal. All condenser microphones need to be powered: either by batteries in the microphone or by phantom power which is 48 Vdc +/- provided by a mixer or phantom supply unit. Condenser microphones are more sensitive and can provide a smoother, more natural sound, particularly at higher frequencies



Ribbon Microphones

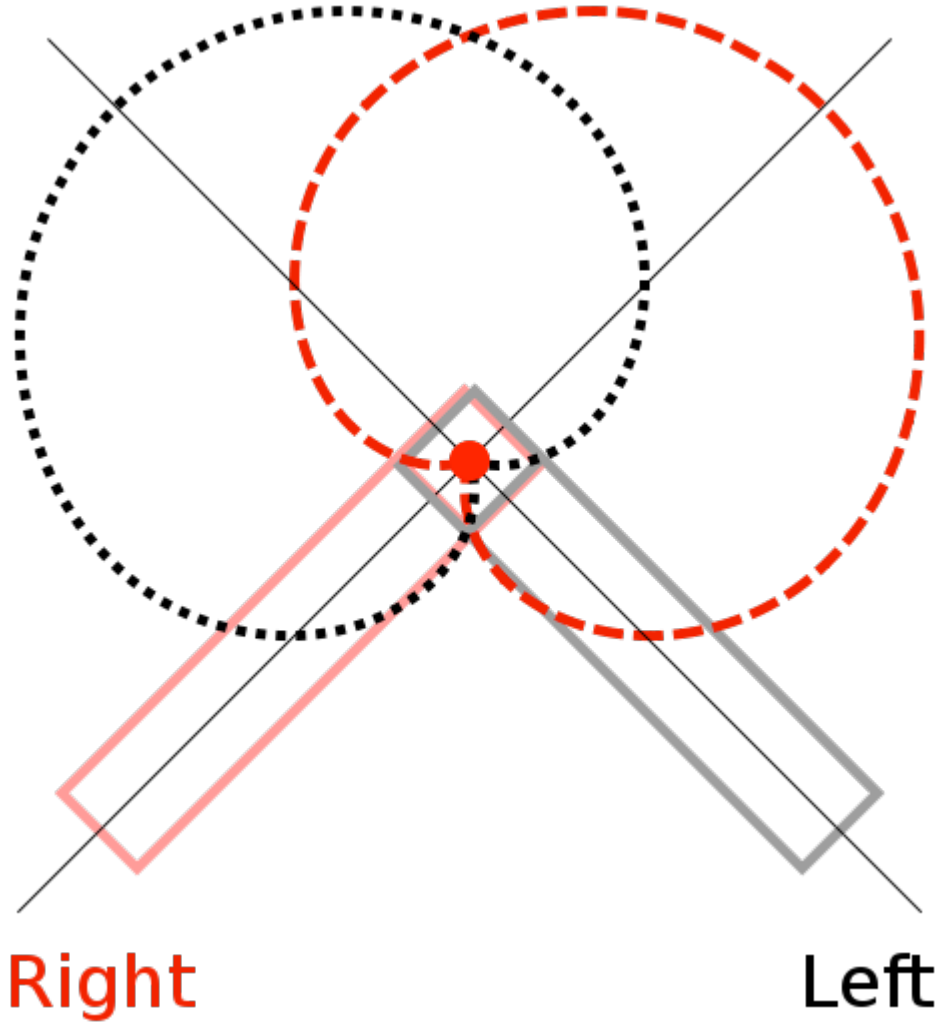
A ribbon microphone is a type of dynamic microphone that uses a thin electrically conducting ribbon placed between the poles of a magnet. Ribbon microphones are typically bidirectional figure 8. The radio broadcast microphones of the 40's and 50's were ribbon microphones typically RCA 44 and 77. Ribbon microphones pick up sounds from in front of the microphone and from the rear but not the side (90 degree angle).



Stereo Recording Techniques:

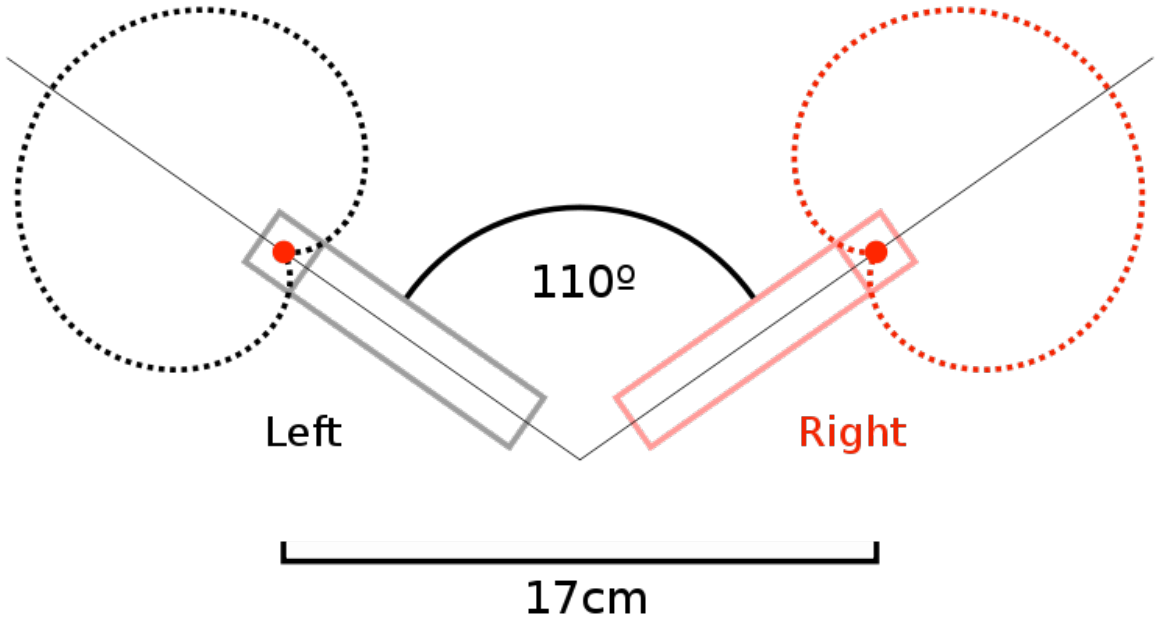
X/Y

The X-Y configuration takes two cardioid microphones and places them at 90 degree angles. The result is that the mike on the left will pickup the right side of the room and the mike on the right will pickup the left side of the room. This technique is good for solo instruments and very small ensembles. Due to the lack of differences in time-of-arrival , the sonic characteristic of X-Y recordings is generally less "spacey" and has less depth compared to recordings employing an AB setup.



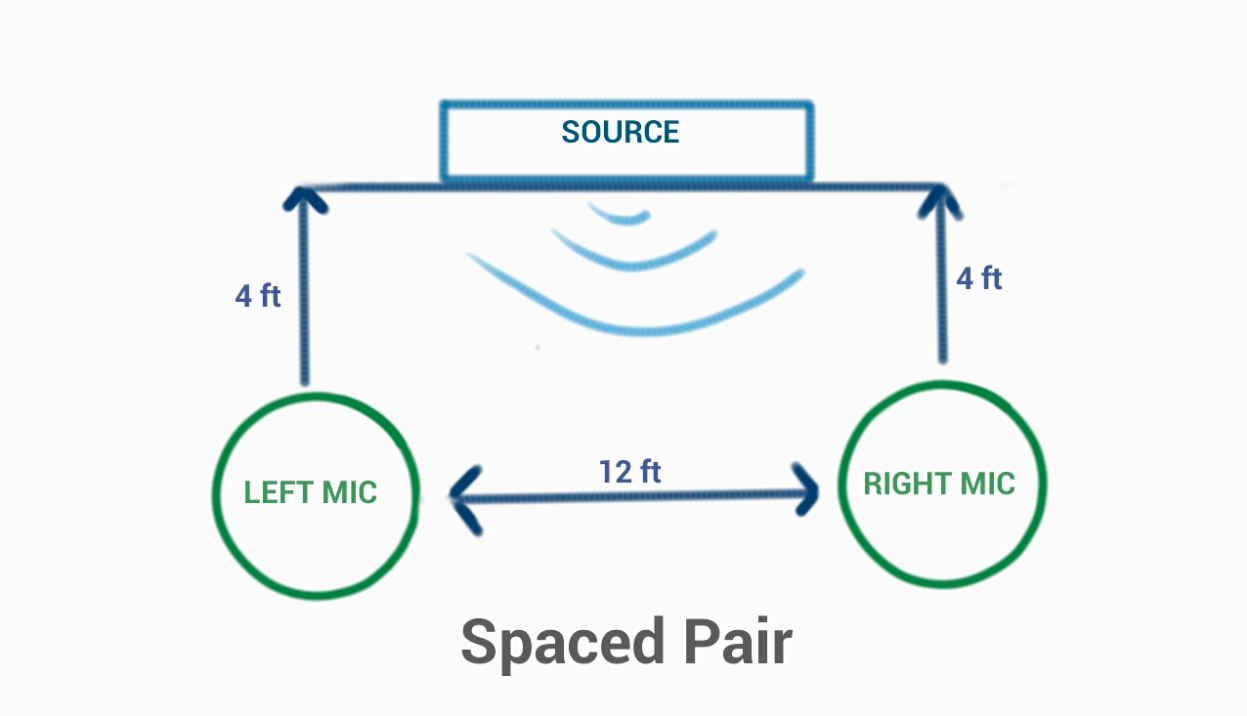
ORTF

The ORTF technique is named after the French television and radio commission who invented it. (Office de Radiodiffusion-Television Francaise) This is a binaural mike technique which means it approximates the distance of your ears. With the ORTF technique two cardioid microphones are placed at an angle of 110 degrees with 17cm or 7 inch spacing. This technique has better stereo separation than XY and works on most ensembles. This technique is good for medium to large ensembles especially bands and orchestras. The stereo spread is wider than XY but not as wide as AB.



Spaced Omni’s or AB

The AB configuration uses two omni directional microphones spaced from about 18" to 12 feet apart. When the microphones are pointed at your source, the volume of the sound hitting the mikes is about the same regardless of where the sound is coming from, but the time at which the sound arrives is different. For example, a sound to the right of the mikes will hit the right mike first and then the left mike. When this is played back, the listener can perceive this delay and use it to determine where the sound is coming from. This technique is commonly used to record choirs and orchestras.



Microphones that are designed for recording

Low Priced Option: **RODE NT5** Price $430 for the pair www.rodemic.com

The RODE NT5 is a condenser microphone with low noise specs and full frequency response. The NT5 is ideal for recording acoustic instruments, drum overheads, cymbals and live performances. The compact externally polarized microphone employs a 1/2 inch capsule. Details include a heavy-duty cast metal body with a satin nickel finish and a cardioid polar pattern. The NT5 requires phantom power and includes a WS5 custom windscreen, RM5 stand mount and the ZP1 zip pouch. The NT5 matched pairs come supplied in a custom carry case with windshields and mounts. Price $430.00 for the pair

Stereo XY Microphone **RODE NT4** Price $530 www.rodemic.com

The RODE NT4 is an X/Y stereo 1/2-inch condenser microphone. The NT4 microphone solves the problem of stereo recording by eliminating the need to purchase matched pairs and the associated complex set-up bars and adaptors to get professional results. With a fixed 90 Degree X/Y configuration and perfectly matched stereo condenser capsules, the NT4 lets you record any source in stereo. Offering selectable battery or phantom power operation with power indicator light. NT4 comes supplied in a custom carry case with a windshield, XLR to mini-jack and dual XLR cables for balanced input connection. Price $530.00

Medium Priced Option: Shure KSM141 Price $400.00 each www.shure.com/americas

Designed for studio use, yet rugged enough for live applications, the Shure KSM141 small diaphragm end-addressed condenser microphone can withstand extremely high sound pressure levels (SPL). Its low self-noise and extended frequency response makes it ideal for recording musical instruments. It also features a rotating collar, allowing easy switching between a highly consistent cardioid or true omnidirectional polar pattern for smooth and extremely focused sound reproduction.

High Priced Options: Neumann KM184 –KM183 Price about $900 each http://neumannusa.com/

The KM 184 (cardioid) and KM183 (omni) have become the studio standard for high-quality miniature microphones. The KM184 features incredibly detailed sound in a low-profile microphone. It excels as a spot microphone for instruments and is known worldwide for use with acoustic guitar. The mic can also be used in pairs as overheads or for ambient room recordings. The Neumann KM183 microphone is an omni-directional, pressure condenser microphone. Transformerless circuitry and balanced output result in high output gain with a very low noise floor. Price about $900 each

Microphone Placement

When placing a stereo pair, it's important to realize that the best place for the mikes may not be the best seat in the house. There are several reasons for this, but the most important is that, even in the front row, there are often things in between the sound source and the microphones that get in the way of the sound. Another problem with placing the mikes at the best seat is that microphones are simply not as good at separating out the various instruments and echoes as human ears are. Try placing the mikes closer to the source than you would normally want to sit to improve the clarity of the instruments. I like to place the microphones about 10 to 12 feet off the ground for a starting point and about 4 feet back from the ensemble. A good rule of thumb is: if you can see the sound source you can also hear it. If you want to hear more of the back of the ensemble raise the microphones if you want to hear more of the front of the ensemble lower the microphones. Many recording engineers like to listen with headphones while they adjust the mike placement until they find the right balance. Using your ears, you can often find a "sweet spot" where everything sounds just right.

Digital Audio Recorders:

Zoom H4n Handy Recorder

Low Priced Option: Price about $250.00 http://www.zoom.co.jp/

24-bit/96kHz Digital 4-track Recorder with 2 Built-in Microphones, XLR and hi-Z Inputs, 50 Onboard DSP Effects, Time-stamping, and Included 2GB SD Card.

Zoom H4n Handheld Multitrack Recorder Features:

- Built-in X/Y stereo mics record at either 90° or 120°
- Four channel simultaneous recording using built-in and external mics
- Large 1.9-Inch LCD screen and improved user interface for easy operation
- 24bit/96kHz Linear PCM recording for pristine recording
- MP3 recording for increased recording time
- Built-in reference speaker to check recordings
- Broadcast Wave Format (BWF) compatible time stamp and track marker
- Records on SD/SDHC media of up to 32GB for maximum recording time
- Auto-record and pre-record feature so you never miss a moment
- 10 hours of continuous battery life
- Built-in mounting joint for tripod and mic stand mounting
- USB 2.0 port for faster file transfer
- XLR inputs with phantom power allow recording with any mic
- Supports plug-in power type external mics
- Hi-Z Inputs for recording guitar and bass
- USB audio interface capability
- Low-cut filter to reduce noise
- Includes 1 GB SD card, wind screen, mic clip adapter, AC adapter, USB cable, protective case and Cubase LE recording software
- Optional remote control (RC4) available

90°
90°
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R
-48 -24 -12 -6 0
SD 005:09:10
FOLDER FILE SPEED WAV/MP3
TRACK 1 2 3 4
INPUT
REC
MIC
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Handy Recorder
H4n
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Tascam DR-100MKII

Medium Priced Option: Price: $250 to 300 http://tascam.com

Tascam's DR-100MKII features four built-in microphones, two cardioid and two omnidirectional, for great sounding recordings. A pair of XLR microphone inputs with phantom power with professional grade condenser microphones, and line in and out connectors are also provided. The markII version adds balanced line ins, S/PDIF digital inputs, locking connectors and more. Price $250- 300

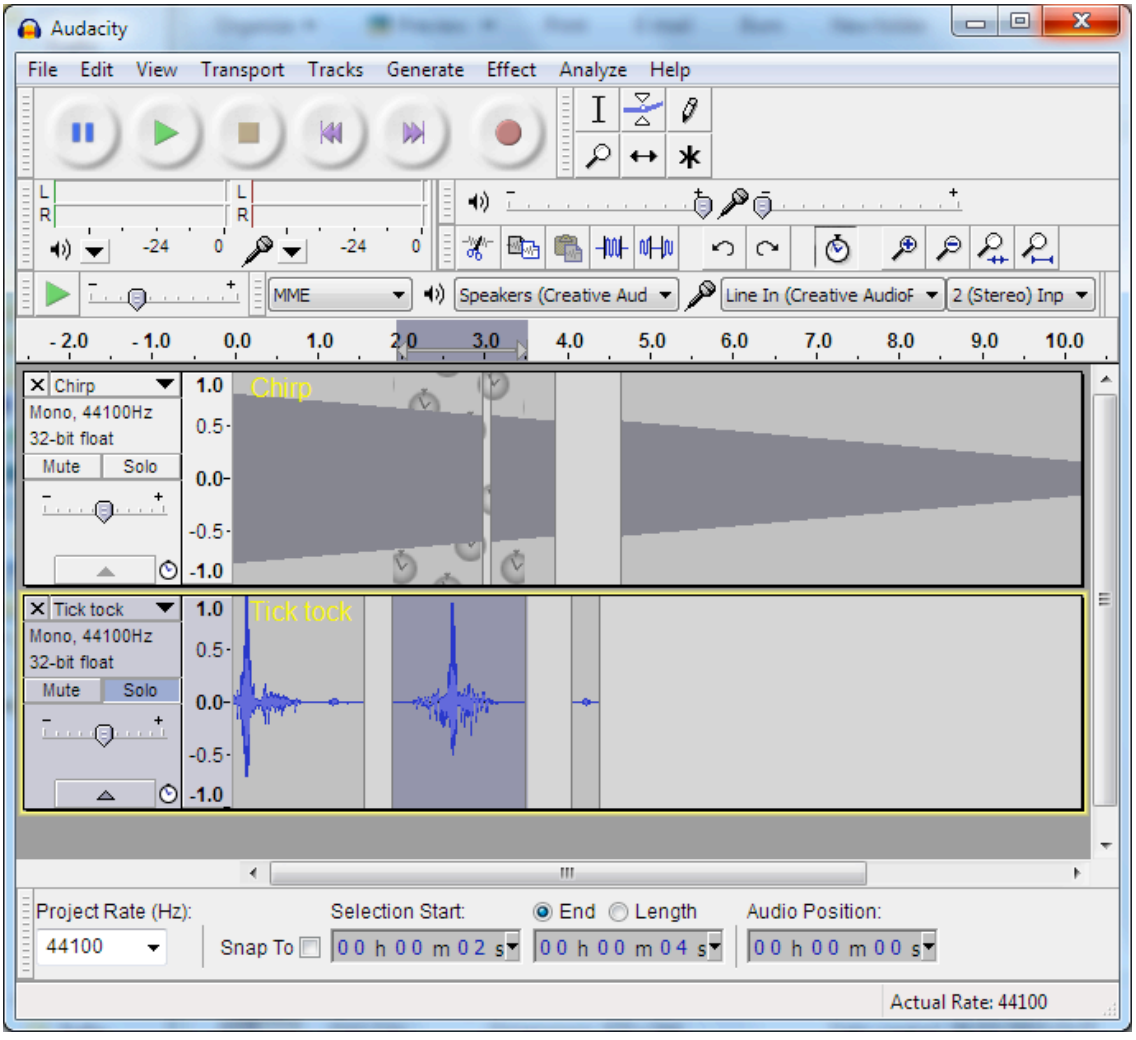
Sound Devices 702

High Priced Option: Price: $2000 www.sounddevices.com

Portable High-resolution Field Recorder

The 2-channel 702 is a file-based digital audio recorder. The compact device records and plays back audio to cost-effective, removable Compact Flash cards, making field recording simple and fast. It writes and reads uncompressed PCM audio at 16 or 24 bits with sampling rates between 32kHz and 192kHz. Compressed (MP3) audio playback is also supported.

Digital Audio Workstation (DAW) Software



Price: Free The software has a large following, but a bit of a learning curve to use all its features.

AVID ProTools:

Pro Tools Express and ProTools 11 Software

Pro Tools is considered the industry standard. The software is very easy to learn and a lot of major recording studio use it and could take sessions made at your school and open them in their studios.

AVID makes many audio interfaces for recording directly into a computer. The following interfaces are the most cost effective.

Fast Track Duo

Price $200 to 250 www.AVID.com

Fast Track Duo comes with everything you need to turn your Mac, PC, into a portable, easy-to-use songwriting and audio recording system. Featuring dual mic preamps/instrument inputs, line-level inputs, and Pro Tools Express software, the studio-grade Duo enables you to sound your best, providing an easy entry into Pro Tools, the music industry standard. Price: $200 to 250

MBox

Price $500 www.AVID.com

Record, edit, and mix performances with the Mbox audio interface. The Mbox has Pro Tools Express software included at no additional charge. You can easily connect mics, instruments, monitors, and other analog, digital, and/or MIDI gear with your computer to capture and create studio-quality productions
Price: $500

Recording on an ipad and Macintosh Computer

Duet for iPad and MacIntosh

A Professional stereo audio interface for iPad and Mac Price: $649.00 www.apogeedigital.com

Apogee Duet is an audio interface, headphone amp and MIDI interface making it easy to create recordings anywhere on your iPod touch, iPhone, iPad or Mac.

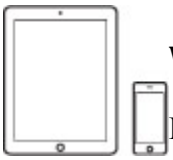
Highlights

Charges iOS device.

Duet charges the iPhone, iPod Touch, or iPad when connected so your work is not interrupted.

Stereo inputs.

2 analog inputs with world-class mic preamps and selectable 48v phantom power for connecting microphones, instruments or line-level devices.



Works with iOS and Mac.

Direct connection with Lightning or 30-pin iOS devices (iPhone, iPod touch, iPad) and USB connection to Mac.

Auria

By WaveMachine Labs, Inc. Price $49.00 http://auriaapp.com

Description

Auria - the 48-track digital audio recording system for iPad.

Auria is a 48-track digital recording system designed from the ground up for the iPad. With professional-level features like AAF import/export, and optional third-party plugin support from names like PSPaudioware, Overloud, Fab Filter and Drumagog, Auria clearly sets a new standard for mobile recording.

FEATURES:
• 48 tracks of simultaneous playback of stereo or mono files. (24 tracks on iPad 1)
• Up to 24 tracks of simultaneous recording when used with compatible USB audio interfaces (Camera Connection Kit required)
• 24-bit recording
• Vintage-inspired ChannelStrip on every channel by PSPAudioware includes Expander, Multiband EQ and Compressor
• 64 bit double-precision floating point mixing engine
• Supports sample rates of 44.1KHz, 48KHz and 96KHz, at 24 bits (iPad 1 only 44.1KHz and 48KHz)
• AAF import and export allows transferring complete sessions between popular DAWs like Logic, Pro Tools, Nuendo, Samplitude and others
• Convolution reverb plugin with included IR library by MoReVoX
• ClassicVerb reverb plugin included
• 8 Assignable subgroups and 2 aux sends
• Time Stretching using Dirac 3 Pro technology
• Real-time audio scrubbing
• Tempo sync and side chain support for plug-ins
• Powerful waveform editor with features like cut/copy/paste, crossfade, duplicate, separate, gain, normalize, dc offset, reverse, and more
• Flexible snapping tools allow snapping to events, cursor, bars, beats and more

• DropBox, SoundCloud and Audio Copy/Paste support
• Inter-app Audio support (IAA)
• Track freeze for minimizing CPU usage
• Full automation support on all controls with graphical editing
• True 100mm faders when used in Portrait Mode
• Optional video import feature allows sample accurate sync of video to an Auria project
• Timeline ruler options include minutes:seconds, bars:beats, samples and SMPTE time
• Auto-punch mode
• WIST support for wireless syncing of other compatible music apps
• AuriaLink allows two iPads running Auria to play and record in sync, allowing for 96 tracks of playback and 48 tracks of recording
• Adjustable metering modes, including pre or post fader, RMS and peak

REQUIREMENTS:
iPad 2 or later recommended
Compatible with all iPad models (iPad 1 has only 24 tracks, 44.1KHz and 48 KHz)
iOS 5.0 or later
USB audio interfaces require Camera Connection Kit

Menu
Edit
Process
The Approach
24:1.1.000
120.00 BPM 4/4
Bars
8:1
16:1
24:1
32:1
40:1
48:1
8 - Bass
9 - Guitar 1
10 - Keys
11 - Congas
12 - Guitar 2
Congas-01.wav

Menu
The Approach
00:00.000
ChannelStrip 13 - Solo
Expander
EQualizer
Compressor
INSERTS
PAN/AUX
PSP Stereo...
PSP ChannelStrip
Congas
Guitar 2
Solo
Shaker
Tambo
Lead Vox
VerseVox
ChorusVox
Kick/Sn
Drs/Perc
Guitars
Vocals
bkgd

Microphone Stands and other misc. items:

Impact Light Stand, Black - 13' (4m) Price $53.00 www.impactstudiolighting.com

This Impact Light Stand is a black anodized heavy duty aluminum light stand that extends to a height of 13 feet. (Lower quality parts)

Manfrotto 1004BAC Master Stand (Black) Price $115.00 www.manfrotto.com

The lightweight construction and compact-size of these stands make them a practical tool for your microphone or portable recorder needs. It extends to a height of 12 feet. (Medium quality parts)

On Stage MY500 Stereo Microphone Bar price $10.00 http://onstagestands.com

The On Stage MY500 stereo microphone bar is made ideal for multiple microphone applications in both live and studio recording settings! Microphone bar fits most standard stands, booms and microphone clips and features brass 5/8 inch - 27 insert threads.

On Stage MA200 5/8-Inch Male to 3/8-Inch Female Mic Screw Adapter $2.00

Zoom MA2 Mic Stand adapter for the Zoom H4n Price $10.00 www.zoom.co.jp